

What is claimed is:

*Sub A*

1. An apparatus for generating and retrieving information based on standardized formats of sentence structure and semantic structure, the apparatus comprising;  
5 a data storing means for storing language knowledge data used to analyze a sentence for information supply and a query for information request from a user, semantic representation data for representing sense of sentence as a conceptual graph,  
10 and Web documents;
- 15 an input means for receiving a natural language query sentence for generation of a natural language sentence for information supply and specification of information request from the user;
- 20 an input sentence analyzing means for analyzing sentence structure of the natural language sentence or the natural language query sentence inputted from the user with reference to data stored at the data storing means to generate semantic structure;
- 25 semantic structure processing means for partitioning the semantic structure analyzed by the input sentence analyzing means to index and store or for computing semantic relevance to search supply information and document most semantically relevant to the requested information specification;
- 30 an interactive processing means for outputting sentence format rule for which failure data from the input sentence analyzing means is corrected depending on the standardized

formats of sentence structure and semantic structure, and indexing and searching result; and

an information transferring means for transferring the data from the interactive processing means to the user.

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2. The apparatus as recited in claim 1, wherein the input sentence analyzing means receives the sentence inputted from the user, sequentially analyzing it by comparing it with data of lexicon storing means, predicate case frame storing means and noun thesaurus storing means included in the data storing means, morphologically analyzes at a morphological analyzer, parses at a parser to generate a sentence structure tree, and performs semantic analysis at a semantic structure generator to generate the semantic structure.

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3. The apparatus as recited in claim 1, wherein the semantic structure processing means includes:

20 a conceptual graph transformer for transforming a conceptual graph outputted from the semantic structure generator depending on semantic relation;

a conceptual graph indexer for indexing the Web documents including the supply information of the user by using a record of a conceptual pair related with each relation transformed by the conceptual graph transformer; and

25 a conceptual graph searcher for searching the supply information having highest semantic relevance between the semantic structure of the user's query and the stored semantic

structure.

4. The apparatus as recited in claim 3, wherein the interactive processing means solves analysis failure of 5 spelling or spacing error, non-sentence disobeying the standardized formats of sentence structure and semantic structure, and ambiguities of the sentence structure and the semantic structure.

10 5. A method for generating and retrieving information for use in an apparatus for generating and retrieving information based on standardized formats of sentence structure and semantic structure, the method comprising the steps of:

15 (a) transforming a natural language sentence (information and knowledge) described by a information provider to a conceptual graph depending on standardized formats of sentence structure and semantic structure and indexing the conceptual graph; and

20 (b) transforming a natural language query sentence inputted from a user to a conceptual graph depending on the standardized formats of sentence structure and semantic structure and searching information relevant to the requirement of the user among the indexed information.

25 6. The method as recited in claim 5, wherein the step (a) includes the steps of:

(c) generating a sentence in which ambiguities of the

sentence structure and the semantic structure of the sentence inputted by the information provider depending on the standardized formats of sentence structure and semantic structure;

5 (d) transforming the generated sentence to the conceptual graph by sentence analysis and semantic analysis; and  
(e) transforming the transformed conceptual graph to a record of a table by relation node and indexing the record.

10 7. The method as recited in claim 5, wherein, at the step (a), a sentence relevant to the standardized formats of sentence structure and semantic structure by generating information for information transaction to guide the user to make the sentence from the user have the standardized format.

15 8. The method as recited in claim 7, wherein, at the step (a), if the sentence structure analysis and the generation of the semantic structure fail, a number of analysis results is presented to the user in orders of analysis to help the user 20 to select a correct sentence or sense.

9. The method as recited in claim 5, wherein the step (b) includes the steps of:

25 (c) analyzing the sentence structure and the semantic structure of the natural language query sentence received from the user and transforming the sentence to a conceptual graph;  
(d) computing the semantic relevance by searching the

semantically nearest conceptual graph at a database to the conceptual graph of the query; and

(e) extracting information indexed by the searched conceptual graph to provide to the user.

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10. The method as recited in claim 5, wherein the step for transforming the natural language sentence (information and knowledge) described by the information provider and the natural language query sentence inputted from the user to the conceptual graph depending on the standardized formats of sentence structure and semantic structure includes the steps of:

(f) morphologically analyzing the natural language sentence by a morphological analyzer when the natural language sentence for information to be provided by the information provider or to be supplied to the information provider and checking whether morphological analysis is performed successfully;

15 (g) if morphological analysis fails, generating failure type data depending failure type, and, if morphological analysis is performed successfully, analyzing the sentence structure by using the morphological analysis result;

20 (h) transforming the sentence analysis tree to the semantic structure depending on the generation of the analyzed sentence structure; and

25 (i) inputting the semantic structure to a conceptual graph transformer depending on appropriateness of the semantic

structure for the standardized format and partitioning the conceptual graph.

11. The method as recited in claim 10, wherein the semantic structure generating step includes the steps of:

(j) receiving from a semantic structure generator a sentence tree (T) in which ambiguities of the sentence structure is solved and transforming the sentence tree (T) to pre-stage conceptual graph (P-CG) depending on a tree transformation rule;

(k) searching information to be processed as a referent from the P-CG by using a numeral and definitive processing rule to define as the referent and processing the conceptual node by setting a proper noun and the tense as type information of the concept by using a thesaurus system, in order to transform the transformed P-CG to a conceptual graph in which the semantic ambiguities are solved; and

(l) after the concept node processing, generating a conceptual graph of a final semantic structure by determining relation between concept nodes by the thesaurus system and frame information.

12. The method as recited in claim 10, wherein the conceptual graph partitioning step includes the steps of:

(j) initializing a highest node level (d) and depth (N) of the partitioned graph in order to retrieve request information and document of the information provider;

5 (k) after the initializing step, searching a relation node (n) that belongs to the level (d) of the conceptual graph depending on comparison result for the highest node level (d) and depth (N) of the partitioned graph;

10 5 (l) determining language characteristic search priority nodes (c1, c2) and computing semantic relevance ( $S(x, y)$ ) of each record searched from a table related to the relation node (n) and depending on the priority rule of the language (L1~Ln) for the determined priority nodes (c1, c2); and

15 10 (m) depending on computation of the semantic relevance ( $S(x, y)$ ), increasing the level (d) of the highest node and repeating the step (j).

20 15 13. The method as recited in claim 12, wherein the semantic relevance ( $S(x, y)$ ) is a distance from a node x to another node y in the thesaurus system and can be expressed as follows.

$$S(x, y) = \frac{1}{1 + d(x, y)}$$

25 20 where  $d(x, y)$  is distance between the nodes in the thesaurus system, and

25 25  $d(x, y)$ , i.e., the distance from the node x to the node y in the thesaurus system, is 0 if the y is one of lower nodes and is computed as the number of edges between the nodes if otherwise.

25 25 14. The method as recited in claim 5, wherein, during the

step (b), information stored and retrieved with respect to semantic relation by partitioning the semantic structure graph and information and document nearest to the request information specification of the user is retrieved by using 5 the semantic relevance between concepts by a noun thesaurus system.

15. An information generating method for use in an information generating apparatus based on standardized formats 10 of sentence structure and semantic structure, the method comprising the steps of:

(a) generating a sentence in which ambiguities in sentence structure and semantic structure are solved depending on the standardized formats of sentence structure and semantic structure from a natural language sentence inputted by a 15 information provider;

(b) transforming the generated sentence to a conceptual graph by sentence analysis and semantic analysis; and

(c) transforming the transformed conceptual graph to a 20 record of a table by a relation node and indexing the record.

16. The method as recited in claim 15, wherein the sentence relevant of standardized formats for sentence structure and semantic structure is generated by guiding the 25 user to make the user's sentence have structures relevant to the standardized formats by generating information for information transaction.

17. The method as recited in claim 15, wherein, if sentence structure analysis and semantic structure generation fail by guiding the user, failure is presented to the user.

5        18. An information retrieving method for use in an information retrieving apparatus based on standardized formats of sentence structure and semantic structure, the method comprising the steps of:

10        (a) analyzing sentence structure and semantic structure of a natural language query sentence received from a user to transform it to a conceptual graph;

15        (b) searching a conceptual graph in a database semantically nearest to the conceptual graph of the query and computing semantic relevance; and

15        (c) retrieving indexed information by the searched conceptual graph and provide it to the user.

19. The method as recited in claim 18, wherein information is retrieved with respect to semantic relation by partitioning the semantic structure graph and information and document nearest to the request information specification of the user are retrieved by computing the semantic relevance between concepts by using a noun thesaurus system.

25        20. A computer readable medium for recording a program for implementing, at an information generating and retrieving apparatus based on standardized formats of sentence structure

and semantic structure having a processor, the functions of:

(a) transforming a natural language sentence (information and knowledge) described by a information provider to a conceptual graph depending on standardized formats of sentence structure and semantic structure and indexing the conceptual graph; and

(b) transforming a natural language query sentence inputted from a user to a conceptual graph depending on the standardized formats of sentence structure and semantic structure and searching information relevant to the requirement of the user among the indexed information.

21. A computer readable medium for recording a program for implementing, at an information generating apparatus based on standardized formats of sentence structure and semantic structure having a processor, the functions of:

(a) generating a sentence in which ambiguities in sentence structure and semantic structure are solved depending on the standardized formats of sentence structure and semantic structure from a natural language sentence inputted by a information provider;

(b) transforming the generated sentence to a conceptual graph by sentence analysis and semantic analysis; and

(c) transforming the transformed conceptual graph to a record of a table by a relation node and indexing the record.

22. A computer readable medium for recording a program

for implementing, at an information retrieving apparatus based on standardized formats of sentence structure and semantic structure having a processor, the functions of:

(a) analyzing sentence structure and semantic structure of a natural language query sentence received from a user to transform it to a conceptual graph;

(b) searching a conceptual graph in a database semantically nearest to the conceptual graph of the query and computing semantic relevance; and

(c) retrieving indexed information by the searched conceptual graph and provide it to the user.